Electronic Design in the Cloud

Dr. Raul Camposano

CEO

Physware Inc.

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- The Cloud

- Electronic Design

The Cloud

Perpetual licenses   **Subscriptions**   **SaaS**

Mainframe   **Mini**   **Workstation**   **Server Farm**   **Cloud**

1960's   2010's
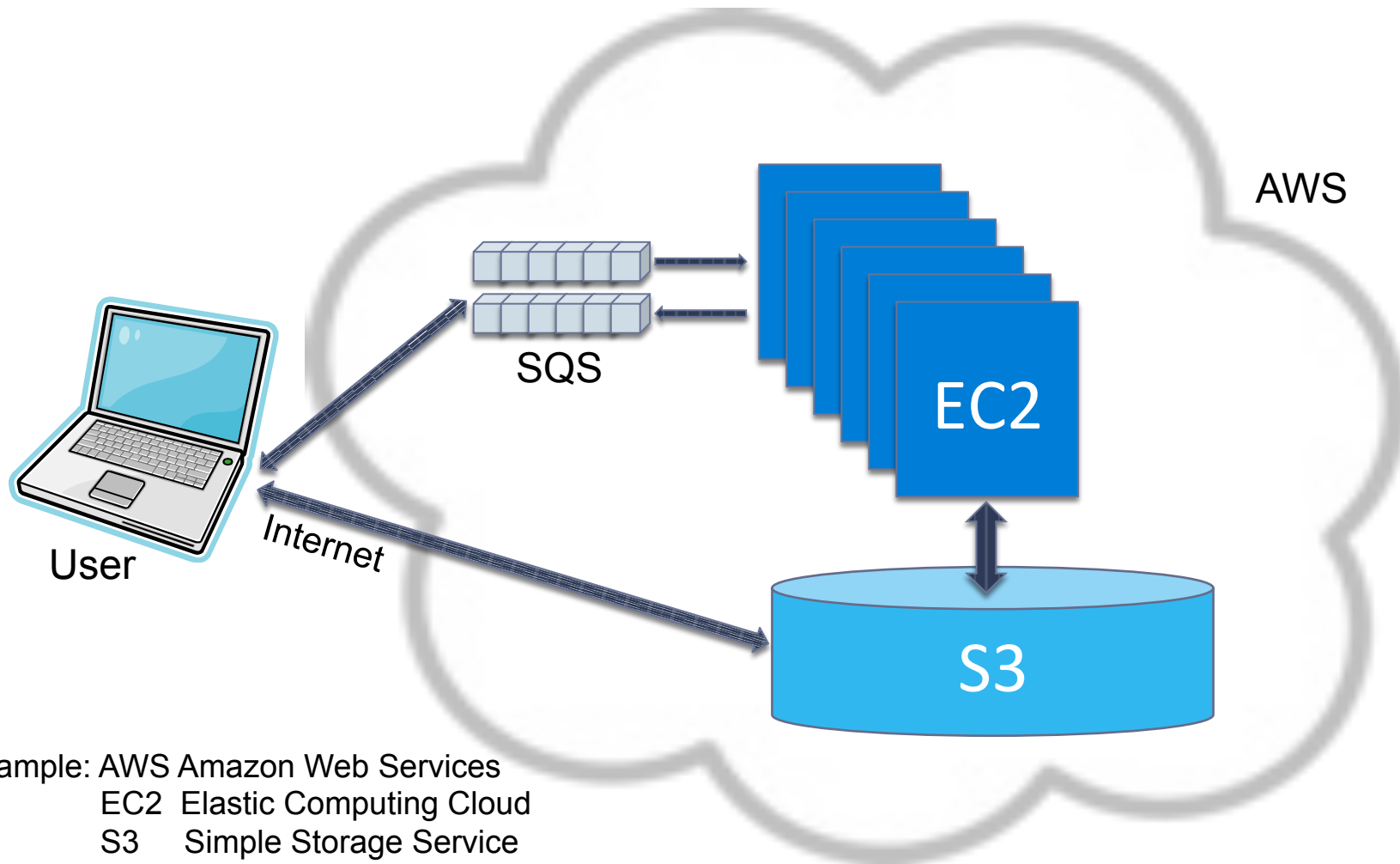
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What It Is

- Utility Computing
  - Illusion of ∞ resources
  - Dis-intermediated from the HW ("virtualization")
  - End user provisioning

- Purchase of services from a catalog
  - From infrastructure…   - Machines, Storage, BW
  - …to Applications   - Software as a Service (SaaS)

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How It's Done

AWS

SQS

EC2

User

Internet

S3

Example: AWS Amazon Web Services
EC2 Elastic Computing Cloud
S3   Simple Storage Service
SQS Simple Queue System

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Advantages for the User

- Illusion of ∞ resources, scalability
- No Capex
- On-demand (pay only for what you use)
- Less need for IT
- End user provisioning, minutes instead of months

Advantages for the Provider

- Economies of scale due to very large computer datacenters: Decrease in cost of bandwidth, operations, electricity…

- Higher utilization by multiplexing workloads

- Simplified operation and increased resources via resource virtualization

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Service Levels

Software as a Service
PeopleSoft

Platform as a Service
Google AppEngine

Infrastructure as a Service
Amazon EC2

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How Big a Deal?

Software-as-a-Service
2012 Market $21B, 20%CAGR

Platform-as-a-Service
2012 Market $9B, 70%CAGR

Infrastructure-as-a-Service
2012 Market $2B, 30%CAGR

Sources: Gartner, IDC, Bessemer

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What Does It Cost

Item	Annual cost
30 dedicated HP ProLiant DL360 G6 servers at $3,879 each, amortized over three years. Each server has two quad-core processors, for a total of 240 cores.	$38,790
Commercial grid middleware at $399/processor with basic support	$95,760
Open source Resource Manager software at $199/processor with support contract	$47,760
Systems administration*: 1.5 FTE at $150,937/year**	$226,406
Hosting fees at $1,000/month for 30 machines***	$360,000
Total	**$768,716**

Item	Annual cost
10 extra-large cloud servers running for a total of 6,570 hours per month at $.68 per hour.	$53,611
RightScale subscription at $1,500/month plus $5,000 annual fee	$23,000
Systems administration*: 0.6 FTE at $150,937/year**	$90,562
Total	**$167,173**

Source: Rightscale

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Everybody is Doing It…

Source: Marketspacenext.com

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Yes But…

CLOUD SEEDING

Selling EDA through a software-as-a-service model is hardly a new concept. It's also not a particularly successful one. Despite some initial hype and sporadic attempts to revive it, the idea has fallen flat due to concerns about version control, security and an almost universal aversion to engineers having to send large files back and forth to a server.

–Ed Sperling

Tags: Altium, cloud, Physware

This entry was posted on Friday, February 18th, 2011 at 12:17 pm and is filed under Editorial, Opinion. You can follow any responses to this entry through the RSS 2.0 feed. You can leave a response, or trackback from your own site.

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Yes But…

- Security
- Large Data Sets
- Cost
- Interactivity

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Security

"Why do you think people started keeping their money in a bank instead of at home? Because the bank has a better safe. So does Amazon. It's even better, as we've seen, than PayPal and Visa. The largest cloud providers have defense resources far beyond anything you could match in your own datacenter."
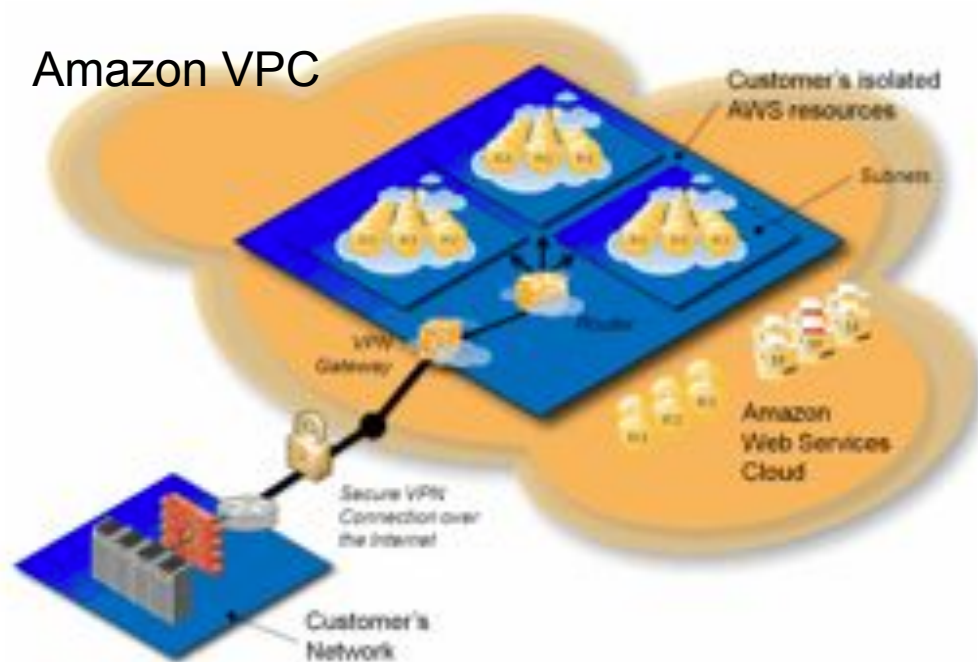
Simon Crosby, CTO of the datacenter and cloud division at Citrix Systems, Inc.

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Security

- Standard security practices
- More secure than most compute centers

Create Key Pair

A key pair has been created for you with the name testkeypair.

Your private key should begin downloading in a few seconds, otherwise click here.

Amazon VPC

Cost

- May be an issue today

- Alternative: Private Cloud

- Eventually Utility computing will be cheaper
  - Millions vs. thousands of servers

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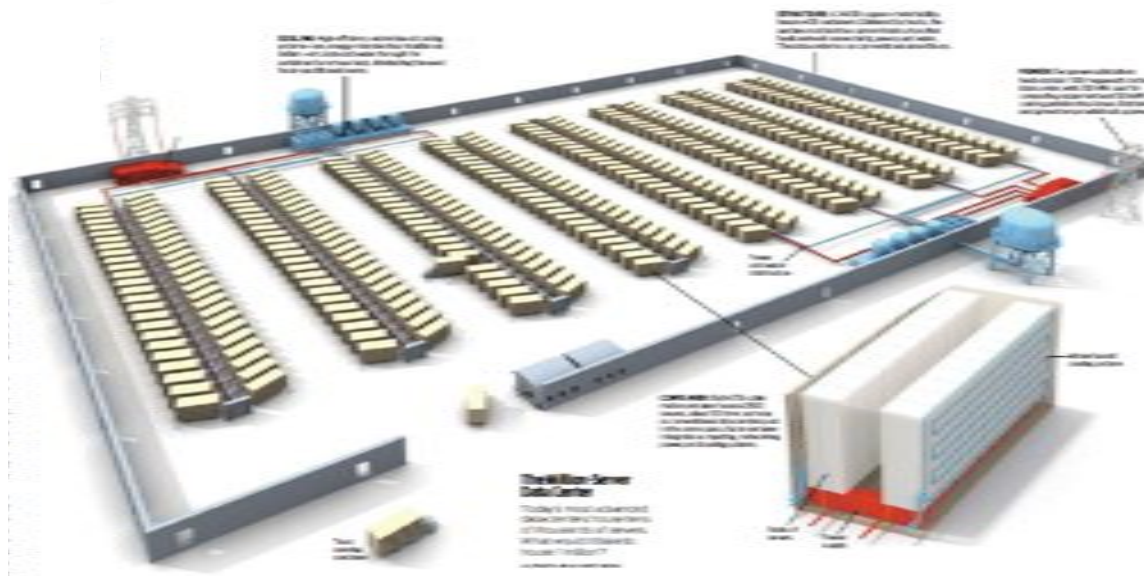
Interactivity

- ## May be a problem

- ## Solutions

  - ### Higher BW

  - ### Detach GUI

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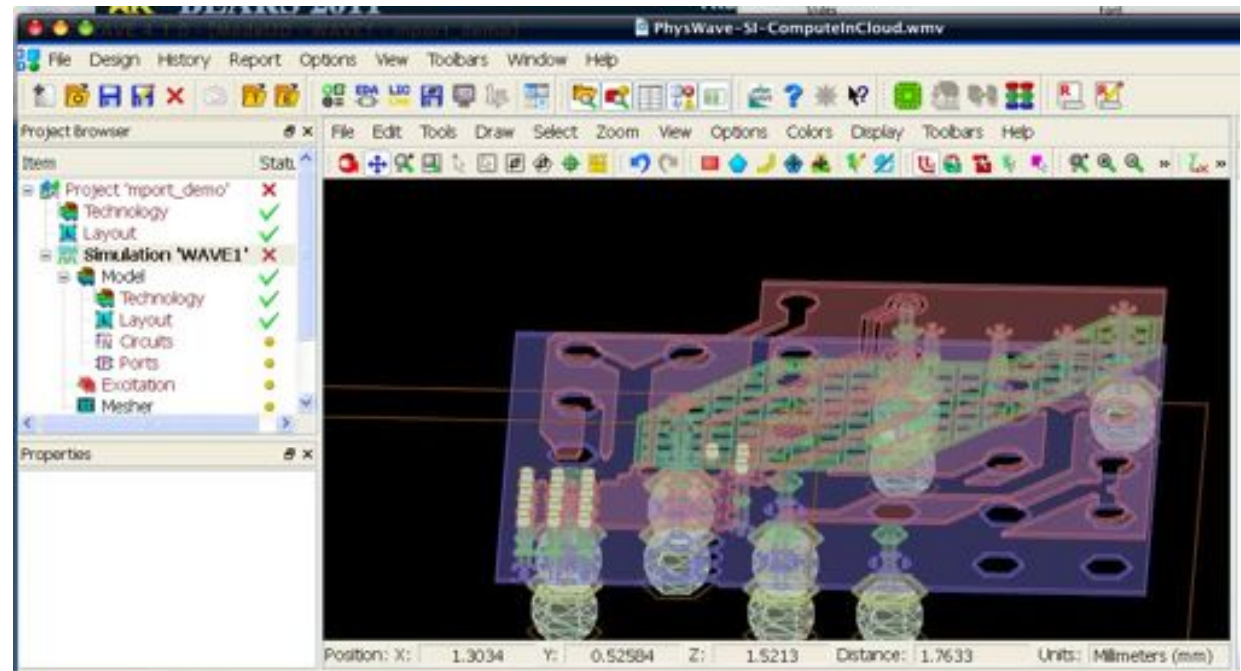
Agenda

- The Cloud

- **Design Technology**

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Design Technology ($B)

- IC Tools
- IP
- Services
- PCB Tools

Values shown: 0.40, 0.54, 1.1, 3.2
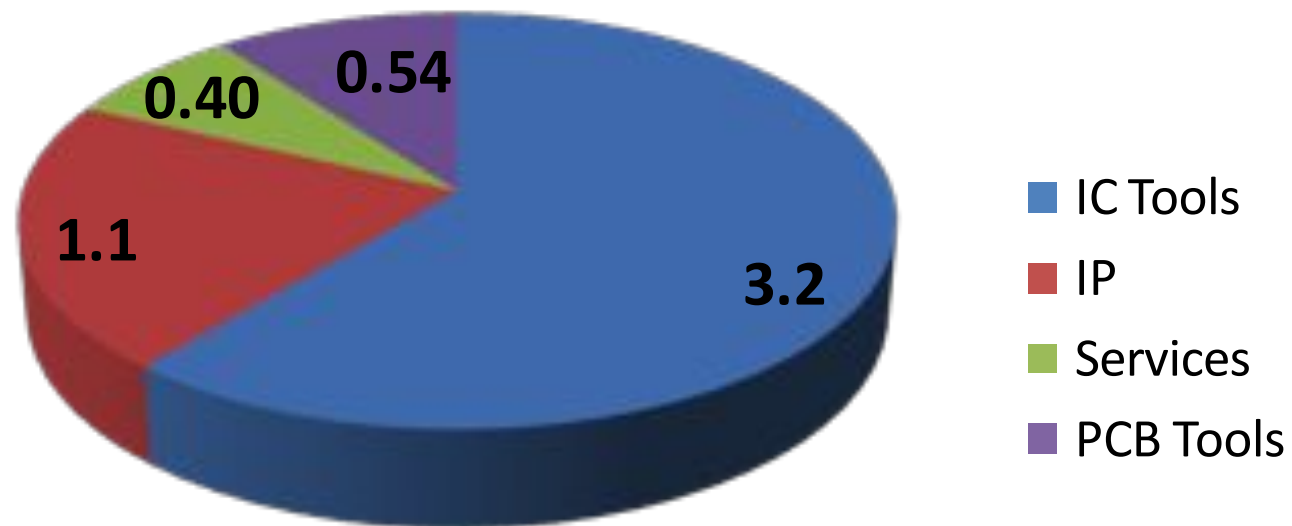
- "Niche"
- … e.g. as compared to Enterprise SW $220B

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Business Basics

Traditional EDA	
• CoGS	20%
• R&D	30%
• S&M	25%
• G&A	8%
• Profit	17%

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Is EDA a Good Fit for the Cloud?

- You know by now…
    - Its (not) parallelizable
    - Its (not) spiky
    - Its (not) a resource hog
    - Customers (don't) love the business model

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3D EM Modeling

- Maxwell accurate fields are used for
  - Die – Package – Board – Backplane - Connector interfaces
- "Smartphones and Tablets will increasingly owe their prowess to better chip packaging"

  Apte, Bottoms, Chen & Scalise, IEEE Spectrum March 2011

Rationale for 3D EM Modelling

- Spiky

- (Easy) parallelization

- Compute intensive, little I/O

- Standardized I/O

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Four Levels of Parallelism

Parametric Frequency

Matrix Solve

Matrix Setup
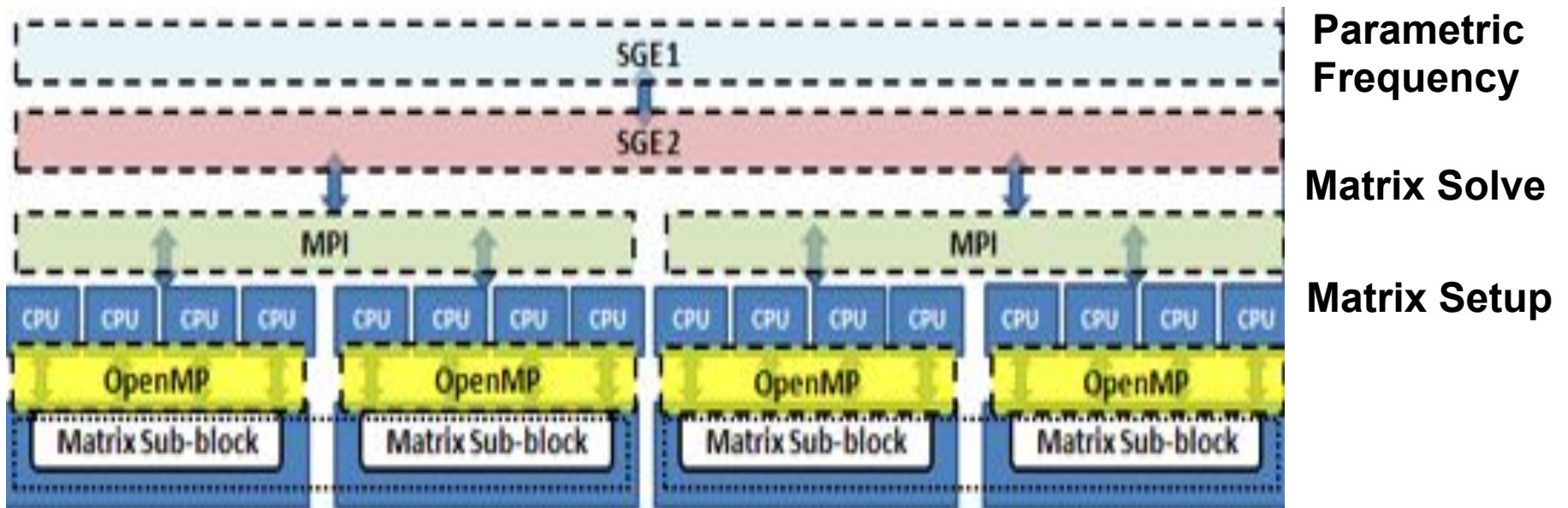
Open MP: Open Multi-Processing, API for shared memory multiprocessing, an implementation of multithreading
MPI: Message Passing Interface, de facto standard for communication in parallel distributed memory systems
SGE: Sun Grid Engine, open source batch queuing system (or Platform LSF Load Sharing Facility)

Example

- Design level   Monte Carlo like
- Ports   1000 ports
- Frequency   100 points
- Solver   4 machines, 8 cores each
- Speedup scales up to 400,000 8 core machines

    1000 x 100 x 3 x 6 = 1.8M

- …conceptually

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Example
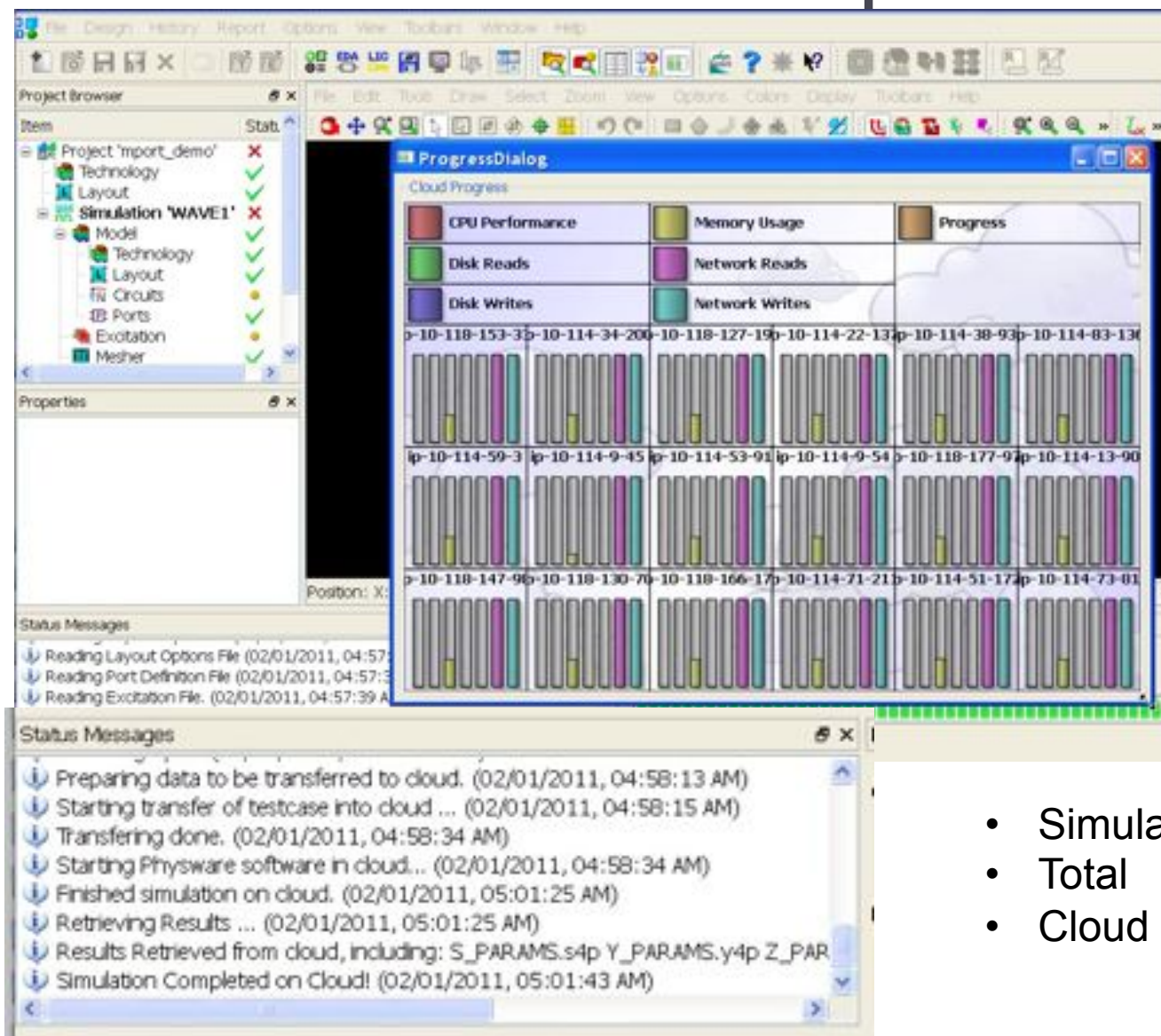
- Simulation time 2:51 (~32x)
- Total   time 3:30 (~26x)
- Cloud Cost $12.24 ($0.71)

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Summary

- ## The cloud is here
  - Illusion of ∞ resources
  - On demand
  - No capex
  - Its cheap
  - Its secure
  - Provisioned in minutes, not months
  - Everyone is doing it

- ## Electronic design will move to the cloud
  - Technical (parallel, spiky, large date) and business (SaaS) advantages
  - 3D EM Modeling example

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